

Use of Montana Highway Bridge Structures by Bats: a Progress Report (16 December 2002)

submitted by:

Paul Hendricks and John Carlson
Montana Natural Heritage Program
P.O. Box 201800
1515 East Sixth Avenue
Helena, MT 59620-1800

The work conducted in 2002 under this contract concentrated on 1) sampling design, 2) identification of sampling sites, and 3) contacts for the construction of specialized equipment used for examination of bridge features. No field inventories were conducted during 2002.

Sampling Design

We have elected to follow as much as is practical the sampling procedures outlined in the Bat Conservation International (BCI) document "Bats in American Bridges." BCI recommends dividing a state (Montana in this case) into sections, either by districts or by geographic or ecological regions.

We have decided to conduct a pilot study in one geographic area, centered on Billings, and focused on Carbon, Stillwater, and Yellowstone counties. In each state section (as defined above), intersections are selected along all major road types (in Montana this includes interstates, U.S. highways, state highways, and county roads) and used as the center point for inspecting bridge structures. From each intersection, equal distances are traveled down each roadway, surveying at least 30 structures. We will focus on non-urban bridge structures.

Preliminary examination of maps referenced with lists of structures along each roadway indicate that the BCI sampling protocol will likely require modification in our pilot study, but our intent will be to follow the BCI procedure wherever circumstance permit, or to examine all bridge structures along specific roadways within the county boundaries we have defined. For example, only 27 bridge structures are present (13 in the Primary System of I-90 and State 78, 3 along State 306, 9 along State 419, and 2 along State 420) in the Primary and Secondary System of Stillwater County between Columbus and Red Lodge. To sample this area will require us to depart from the BCI protocol. It is possible that we will need to extend our sample of bridges into adjacent counties, but this will need to be determined once we are on the ground and have a better idea of how many bridge structures can be examined each day by each team.

Data collected at each site (bridge structure) include construction materials, design, structure measurements (length, height, width), roost dimensions (if a roost is discovered), substrate and texture, overhead closure, substrate beneath potential roosting area, and local land-use pattern. We intend to collect data on the variables listed on template data sheets in the BCI document "Bats in American Bridges."

Sampling Sites

Sampling sites are defined as all bridge structures along the set of roadways that we will survey. Lists of potential sites, with descriptions of their type of construction, size, and location were downloaded from the Montana Department of Transportation on-line Bridge Inventory Books. From these we identified all bridge structures listed for the three pilot counties. Each county listed bridge structures in the following five categories of roads: interstate, primary system, secondary system, local state-maintained, off system. From the inventory books we compiled lists of the number of concrete spans, steel spans, and wooden spans for each county and road type, lumping different types of construction design into categories based on the primary material used in the construction of the main span.

A total of 482 bridge structures were listed for Carbon, Stillwater, and Yellowstone counties, comprised of 290 concrete spans, 128 steel spans, and 64 wooden spans. These are distributed among the three counties and five roadway types as presented in Table 1. Bats tend to favor concrete spans because the thermal properties of concrete provide more favorable roosting micro-environments than other types of materials, although spans built of all types of material are used in other regions of North America. Thus, the preliminary analysis of sites in our proposed study area indicates adequate sample sizes of different span types are present that will allow us to identify which span types, based on construction materials, are favored by bats in this region. Fortunately, the largest category of spans present in the study area, based on construction material, is the type most likely to be used by bats, and should allow a further analysis of the type of bridge structure most favored, based on design.

Table 1. The number of non-urban highway bridges in three Montana counties. Displayed numbers are: total # of bridge spans (# concrete, # steel, # wooden).

Bridge System	Carbon Co.	Stillwater Co.	Yellowstone Co.
Interstate	0	40 (35, 5, 0)	89 (78, 11, 0)
Primary System	19 (10, 4, 5)	11 (6, 0, 5)	20 (10, 8, 2)
Secondary System	1 (0, 1, 0)	14 (11, 2, 1)	28 (19, 7, 2)
Local State-Maintained	0	14 (5, 9, 0)	31 (11, 8, 12)
Off System	54 (17, 20, 17)	26 (3, 16, 7)	135 (85, 37, 13)
Total	74 (27, 25, 22)	105 (60, 32, 13)	303 (203, 71, 29)

Contacts

We will require some specialized equipment in order to examine some difficult-to-reach portions of the highway spans, especially the spaces between span sections. BCI has indicated a video camera lens attached to an extendable pole is extremely useful for these kinds of inspections. Commercial models of the camera and extendible-pole system are available at considerable expense. We have been in contact with Dr. Glenn Proudfoot, Department of Wildlife and Fisheries Sciences, Texas A&M University, the designer of the original model (see Wildlife Society Bulletin 24:528-530, 1996) upon which the commercial models are based. Following a series of inquiries, he has agreed to build the devices for us (one per field crew) for the cost of the materials alone.